

The impact of COVID-19 on e-commerce: a cross-national analysis of policy implications

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ABSTRACT

The field of e-commerce research has evolved over recent decades, but the coronavirus disease 2019 (COVID-19) pandemic significantly accelerated its prominence, as evidenced by extensive literature. The pandemic underscored the pivotal role of e-commerce in driving the digital transformation of the global economy. However, there remains a lack of comprehensive reviews in this area, particularly comparative analyses of how different countries leveraged e-commerce to navigate the pandemic's challenges. This paper addresses this gap by examining the literature on e-commerce adoption and its implications during COVID-19, focusing on select countries, including China, Malaysia, and several European nations. The case of China, as a major economic power in Asia, offers particularly valuable insights.

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1. INTRODUCTION

Small and medium enterprises (SMEs) adapted quickly, driving increased online spending, with 57% of purchasing managers reporting higher expenditures and 22% noting significant growth [1], [2]. The coronavirus disease 2019 (COVID-19) pandemic accelerated e-commerce and digital transformation, pushing businesses online and highlighting the importance of technological infrastructure. SMEs adapted quickly, driving increased online spending, with 57% of purchasing managers reporting higher expenditures and 22% noting significant growth. The business-to-business (B2B) marketplace also experienced substantial growth [1], with gross merchandise volume reaching \$31.19 billion in 2020, contributing to a total market value of \$1.3 trillion.

The United States has witnessed a rapid increase in e-commerce adoption, making it a major driver of consumer spending [3]. In contrast, Malaysia's e-commerce sector remains relatively underdeveloped [4]. The US market, with its favorable conditions for the rapid development and deployment of digital solutions, experienced a surge in online shopping due to heightened consumer concerns during the pandemic [5]. This trend was particularly pronounced among millennials and gen Z, whose distinct shopping behaviors were influenced by concerns about COVID-19 and its economic impact [6]. The Dotcom Distribution 2020

e-commerce customer study further supports this, revealing that 26% of respondents reported increased digital purchases due to pandemic-related restrictions [7].

The pandemic has significantly altered consumer buying habits, emphasizing convenience and accessibility, which in turn has placed greater strain on e-commerce supply chains [5], [6]. While the rapid growth of e-commerce is expected to stabilize post-pandemic, its lasting impact on consumer behavior and the retail landscape remains evident [5]. Governments worldwide now face the challenge of balancing public health measures with the need to support the digital economy [8]. The growing importance of data privacy in the digital age necessitates robust cybersecurity laws and effective enforcement mechanisms [9]. The absence of adequate legal and regulatory frameworks increases the risk of cybercrime and privacy breaches, underscoring the need for international cooperation to address these global challenges [9].

The adoption of digital technologies—including information, communication, and networking tools—has become imperative for businesses [10]–[12]. E-commerce, in particular, has emerged as a powerful enabler for SMEs, allowing them to compete effectively with larger enterprises while contributing to technological progress, job creation, and economic stability [13]. In the Asia-Pacific region, SMEs constitute 97% of all businesses and employ more than half of the local workforce [14]. The pandemic further underscored the importance of e-commerce in safeguarding jobs during times of crisis. A survey of experts from 22 European countries found increased use of digital tools for virtual meetings, remote work, and e-commerce during COVID-19. Businesses expect online meetings and reduced business travel to remain common post-pandemic. The study also identified barriers to digitization and proposed solutions for wider adoption [15].

The purpose of this study is to examine how the COVID-19 pandemic has positioned e-commerce as a critical driver of future economic activity. The research will achieve this by:

- Analysing existing literature to understand the growth and impact of e-commerce during the pandemic.
- Assessing the progress of e-commerce adoption across different countries.
- Providing a comparative overview of policies and strategies implemented by selected countries to foster SME resilience through e-commerce capabilities.

The study focuses on China, the United States, Germany, and Malaysia, highlighting the specific benefits e-commerce brings to each country's economy. Additionally, the paper aims to clarify existing knowledge gaps and suggest potential avenues for future research in this crucial field. The paper is structured as follows: section 2 outlines the research methodology. Section 3 provides a general overview of SMEs to contextualize the subsequent country-specific analysis. Section 4 examines the e-commerce experiences of the chosen countries during the pandemic. Section 5 discusses the key findings and policy implications. Finally, section 6 concludes the paper.

2. METHOD

This literature review assesses the current research on the interplay between e-commerce, policy, digital experience, and their impact during the COVID-19 pandemic. It aims to identify key research questions, limitations, methodologies, and knowledge gaps. The study employs a four-phase bibliometric analysis approach, as shown in Figure 1: designing search keywords, collecting research results and creating a dataset, outlining findings, and analyzing the results.

The first phase of the study involves using keywords like “COVID-19,” “e-commerce,” “literature,” “review,” “policy,” “digital,” and “experience,” along with synonyms and related terms, to conduct a comprehensive literature search. Boolean operators enhance the search: the AND operator ensures all aspects of the subject are covered, while the OR operator connects synonymous and similar terms, broadening the search. For example, terms like “Covid-19” OR “coronavirus” OR “pandemic” are combined with “e-commerce” OR “online shopping” OR “digital marketplace,” and so on.

In the second stage, the search phrase will be applied to research databases like Web of Science and Scopus, focusing on English-language publications from 2014 to 2024 for the most relevant studies. The search will include various formats such as journal articles, review papers, book chapters, conference proceedings, and patents [16]. Duplicates and irrelevant findings will be removed, leaving a final dataset of 1,298 distinct documents.

The third stage involved outlining the findings using bibliometric tools. Using bibliometric methods, the findings were outlined in the third stage. Based on relevant requirements including study themes, methodology, publication year, and geographic focus, the gathered data will be arranged and classified. The R statistical program is used in this work, namely the bibliometrix package [17] and biblioshiny, its online application. Numerous analyses, including as reference tracking, content analysis, and corpus pre-processing, are made easier by these technologies. Datasets from WoS and Scopus were combined

using the bibliometrix package's mergeDbSources function to create a single, comprehensive dataset for analysis. The "remove.duplicated" variable was set to "True" to automatically eliminate duplicate records.

The last stage is the collected literature will be subjected to bibliometric analysis [18], [19]. To identify key research clusters, trends, and patterns, the bibliometric review method examines keyword co-occurrence, citation networks, and the evolution of research themes over time. In the context of COVID-19's impact on e-commerce, policy, and digital experiences, this approach provides a structured overview of current research, highlighting key focus areas and potential future research directions in selected countries.

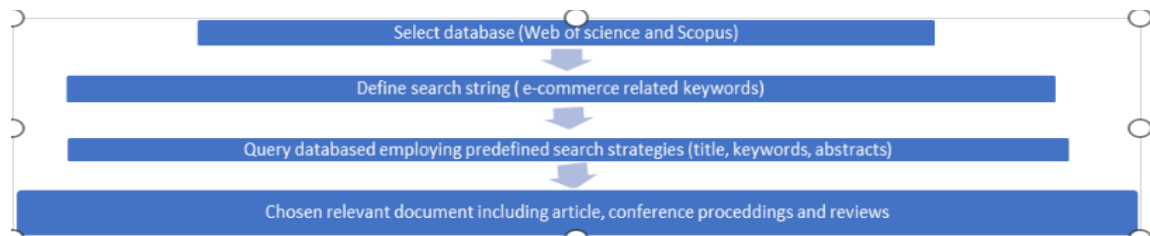


Figure 1. Four-phase bibliometric analysis approach

2.1. SME: a general overview

The definition of an SME in China is complex and depends on the industry sector as well as on factors like the number of employees, annual revenue, and total assets. The SME promotion law of China (2003), which establishes guidelines for classifying SMEs, provides the foundation for this standard for small and medium-sized businesses (SMEs) [20]. In Malaysia, an SME is a business with fewer than 200 employees and a manufacturing turnover of no more than RM50 million. Small-sized business, 75 full-time employees or less, operating in the service and manufacturing sectors, a small business with annual sales of no more than RM300,000 OR no more than five full-time employees. However, SMEs differ depending on the company in the services and other areas. However, SMEs are distinguished for the services and other industries based on either the company's annual sales turnover (not to exceed RM20 million) OR the number of employees (not to exceed 75). Sales revenue for small businesses of no more than RM3 million OR a personnel headcount of no more than 30 [21].

In European nations, personnel headcount, turnover, or balance sheet total are the main determinants of whether an organization is a SME. A medium-sized business has a sales turnover of less than €50 million. OR balance sheet total is no more than €43 million, and there are no more than 249 full-time employees. A small business is classified as falling into this category if it has a balance sheet total of less than €10 million or a sales turnover of less than €10 million. The number of full-time workers does not exceed 50. For micro-sized businesses, the maximum number of full-time employees is 10, and the balance sheet total and sales turnover cannot exceed € 2 million [22].

2.2. SMEs and e-commerce during COVID-19: a review of experiences China

With 4,634 fatalities and 83,565 confirmed cases to date, China was the first nation to announce a COVID-19 lockdown [23]. Mention that reports mention that additional cases have emerged, with fresh cases surfacing from the Beijing market [23]. Strict steps were implemented to bend the infection curve and fundamentally stop the transmission of the virus. The Chinese authorities imposed a total lockdown on the city of Wuhan on January 23, 2020. All major thoroughfares were closed, and eleven million people were quarantined. The city of Wuhan's residents and economy faced significant difficulties as a result of the 60-day lockdown [24]. The lockdown immediately cut off communities from their regular supply chain, but it also sparked an excellent response from China's retail behemoths, which are distinguished by a high level of innovation and flexibility in terms of technologies deployed, skills leveraged, processes used, and the variety of goods and services offered [24].

The COVID-19 issue and ensuing difficulties had a significant negative impact on China's SMEs, a cornerstone of the Asia Pacific economy. The pandemic exposed a weakness in the Chinese economy, notably the fact that the majority of SMEs there lack the financial flow needed to last more than three months [14]. According to estimates, losing these tiny firms might cause up to 70% of China's gross domestic product (GDP) to disappear. During the pandemic, Chinese e-commerce behemoths Alibaba and JD.com stepped in to help these smaller businesses [14]. E-commerce companies offer all-encompassing solutions that go beyond a simple platform to help merchants and enterprises make the crucial transition from offline to

online businesses [25]. The sales of online retail items and consumables (home necessities) have quadrupled compared to the same period last year on JD.com, China's largest online retailer. People are spending more money through the virtual channel on average by 10% to 30%, according to a poll by engine [6].

For small firms, which are more likely to close, the drop in sales caused by COVID-19 is more than concerning. Those prepared to handle the growth of the e-commerce market are in a great position to survive the epidemic [7]. Even during the middle lockdown in Wuhan, e-commerce companies in China performed a crucial part in the supply chain by providing their customers with goods and services [8]. Big data, artificial intelligence (AI), cloud computing, and other cutting-edge technologies are being supported by the Chinese government to track pandemics, identify infections, find cures for illnesses, and get people back to work [26]. Intelligent logistics systems advance delivery logistics by automatically rerouting distribution vehicles via lockdown zones and in the direction of the least congested location. This reduces delivery times at crucial points throughout the crisis.

Ant Financial introduced a blockchain-based virtual online tender system in the Gansu Province to give SMEs a distant company formation option during the COVID-19 outbreak. Blockchain technology renders certain tender process resources and procedures tamper-proof, guaranteeing the transparency and dependability of distant participation [23]. Alibaba owes much of its early success to its thriving B2B bazaar, and the collaboration has continued with an emphasis on its connections to small enterprises. Alibaba announced its 2020 Spring Thunder Initiative in April, promising to support export-focused SMEs in breaking into new countries via its e-commerce network, which includes well-known platforms like AliExpress, Lazada, and Tmall World [14].

Through its many subsidiaries, online commerce platform suppliers and internet giants are promoting digital transformation initiatives for SMEs. These initiatives include working with up to 1,000 manufacturing facilities to improve the digitization of their supply chains and machinery and establishing 1,000 Alibaba digitized agricultural centers throughout China [14]. Duo-chain, a blockchain-powered financial platform created by Ant Financial, helped many SMEs in loan applications from banks by adopting their receivables from big businesses as collateral and releasing crucial financial resources to cash-strapped SMEs [23], [14]. This benefited companies that might have faced financial difficulties during the outbreak. They have provided "tens of millions" of small and microbusinesses with much-needed loans through their virtual merchant bank [14]. All small businesses suffered significantly from the COVID-19 outbreak. Through its virtual merchant bank, they have given "tens of millions" of tiny and micro businesses much-needed loans [14]. All SMEs across industries were severely impacted by the COVID-19 epidemic, and cross-border e-commerce provides them with a safe refuge to weather the storm.

The vice-chairman of the China Center for International Economic Exchanges claims that China's prospective economic growth will be aided by successful cross-border e-commerce. Still, it offers the rest of the world fresh opportunities. As a result, Chinese business partners from all over the world would have to participate in cross-border e-commerce, which would be advantageous in terms of economic globalization [25]. JD also assists offline sellers by giving them easier access to affordable goods valued at more than RMB50 billion (about \$7 billion), obtained from more than 4,000 combined warehouses and 10,000 suppliers nearby [14]. These solutions cover the entire company life cycle and help firms automate their operations. Because of this situation, the economy of small stalls and workshops can grow and become dynamic, bringing new opportunities to the market and preserving jobs [14].

According to a report by [27], China's State Council urged private banks to delay loan interest and principal repayments for small businesses facing cash flow issues. In early 2020, state-owned banks were tasked with increasing small firm lending by 30%, and government policy banks allocated RMB 350 billion (\$49.7 billion) for support. Additional measures included rent exemptions, tax cuts, and reduced social security contributions for small businesses.

2.3. United States

E-commerce has become an increasingly significant consumer spending component in the United States, with online retail sales increasing in recent years [28], [3] as more consumers embrace the convenience and accessibility of digital shopping platforms [3]. The percentage of Americans planning to make an online purchase has been 7.2%. However, data on overall retail sales show that e-commerce's contribution is gradually rising, from 10.8 percent in Q2 2019 to 16.1 percent in Q2 2020 (food services were excluded), with the COVID-19 context serving as the major contributor [29], [30].

The COVID-19 pandemic drove a 97% surge in Walmart's e-commerce sales, setting a new record for same-day delivery orders. Amazon also saw significant growth, with a 40% increase in net sales, benefiting greatly from the global shift to online shopping [31], [30]. Amazon is launching a digital storefront for luxury goods from independent designers, in collaboration with Vogue and the Council of Fashion Designers of America. Additionally, Amazon is contributing \$500,000 to the Common Threads award

program, which raised \$4 million to support apparel manufacturers, merchants, and providers during decreased demand [1]. In addition, Amazon announced plans to hire 175,000 additional workers [8].

According to the US Census Bureau, from April to May, sales of electronics and appliances, and furniture and home furnishings rose by 50.5% and 89.7%, respectively, according to the US Census Bureau. While e-commerce grew significantly during the COVID-19 pandemic, sectors like gas stations, groceries, and auto parts saw less impact [29]. The COVID-19 pandemic in the United States led to a 52% increase in demand for direct-to-consumer (DTC) products across categories such as home, fashion, beauty, electronics, and food in 2020 [1]. During the COVID-19 pandemic, DTC brands outperformed traditional retailers. While 80% of conventional retailers saw sales decline, 22% of DTC brands experienced sales growth [1]. Despite the changes COVID-19 brought to e-commerce, meeting customer expectations remains a key challenge. According to ShipStation's national customer pulse research, flexibility, messaging, and sustainability are now top priorities for consumers [32].

Clear and upfront information on digital shops helps improve customer perceptions by providing details on partnerships, policies, inventory levels, and shipping. Merchants should ensure this information is relevant and easily accessible before and after transactions. Despite its importance, many retailers overlook these essential customer communication principles [32].

2.4. Germany

Germany led digitalization efforts during the COVID-19 pandemic as part of a broader EU strategy. The European Commission's 'Digital Innovation Hubs' helped guide businesses in digital transformation [33]-[35]. Italy and Poland have lower levels of digitalization and ICT personnel in total employment compared to the EU average. In contrast, Germany leads Europe with higher digital adoption and a stronger ICT workforce [36]. Germany, a global leader in Industry 4.0, introduced the concept in 2011 at the Hannover Trade Fair. The German Federal Government further advanced it through the strategic initiative platform Industry 4.0 [37].

Germany's high-tech strategy focuses on human-machine interaction and digital applications in manufacturing. Its success in Industry 4.0 is driven by collaboration among industry associations and Fraunhofer Institutes [38]. By November 2020, Germany, once seen as a global model for managing COVID-19 and economic recovery, faced its biggest challenge as daily infections surged into the five figures and confirmed cases surpassed one million.

Germany's March 2020 lockdown impacted businesses, especially SMEs (Mittelstand), which make up a large portion of employment and government revenue. Despite these challenges, there is a strong push for innovation and digitization within the Mittelstand [25]. According to Microsoft CEO Satya Nadella, the COVID-19 pandemic pushed German businesses, including the "Mittelstand," through two years of digital transformation in just two months. Digitalization became a top priority for 89% of German firms, with 34% reporting significant growth. The German government allocated up to 25 billion euros (\$28 billion) for Mittelstand support as part of its economic stimulus plan, which also included a temporary VAT reduction to provide additional financial relief [20], [26].

2.5. Malaysia

The COVID-19 pandemic and Malaysia's movement control order (MCO) led to an unprecedented economic downturn, with the country's GDP shrinking by a record 17.1% year-over-year in Q2 2020 [39]. Due to Malaysia's MCO to curb COVID-19, 32,469 businesses closed, including 9,675 SMEs from March 18 to June 9 and 22,794 SMEs from June to September. Most of the closures were micro-SMEs, many of which reported receiving no government assistance. The studies by [40], [41], showed that due to lockdowns and social distancing, e-commerce became the preferred option for businesses. However, its benefits vary by industry, with sectors like tourism and construction facing challenges in adopting e-commerce. The article also identified barriers to e-commerce adoption, which policymakers should consider when promoting its use among SMEs.

Digital marketplaces are one type of business that might do well in this difficult environment [42] despite the difficulties. The COVID-19 crisis, according to Carousell's country head for Malaysia, Tang Siew Wei, had accelerated the shift in customers' shopping habits, and it was anticipated that it would soon become the new norm for most Malaysians [42], [43]. To recover revenue lost from traditional channels, businesses are adopting digital strategies. Those that resist digital transformation will struggle to survive as more businesses shift online [39]. The agricultural sector embraced e-commerce during the MCO, with Cameron Highlands farmers selling 70 tonnes of crops online via Lazada in three weeks after logistical issues initially led to wasted harvests [39]. Even traditional services like air conditioning repairs, CCTV installation, and Malaysian mamak food booths are now available online via platforms like Carousell [43].

The second wave of COVID-19 in Malaysia threatens over a quarter of SMEs, risking their closure [44]. The PRIHATIN package moratorium ended on April 1 after six months, and around 3% of the RM300 billion in SME loans are in default, totaling RM100 million [44]. A platform with a significant virtual presence is necessary for e-commerce to promote one's brand or items and to inspire trust and security [43]. Ganesh Kumar Bangah, the founder and executive chairman of the logistics company, claimed that logistics and transport services were crucial in supporting e-commerce by assuring the consistency of daily deliveries to customers [42]. While some industries face challenges in adopting e-commerce, SMEs that have integrated it are expected to outperform traditional businesses. However, this advantage may not be enough to fully offset the economic impact of the pandemic [45].

3. RESULTS AND DISCUSSION

This section presents and discusses the research findings. The high costs and complex processes associated with dedicated e-commerce platforms have led many SMEs to adopt social media as a more accessible alternative for online sales [28]. The limited resources of small businesses, compared to larger corporations, often hinder their ability to adapt to changing circumstances [46]. The COVID-19 pandemic exacerbates capital and liquidity challenges for SMEs. A study [47] suggests solutions like trade credits and alternative funding models, while also highlighting that crises can present unique opportunities for SMEs to leverage their agility and customer proximity.

Despite their vital economic role, SMEs are particularly vulnerable to crises like COVID-19 due to their often-precarious financial situations [48], [49]. Thorgren and Williams [48] Swedish SMEs during the pandemic reveals they adapted by cutting costs and delaying investments, while avoiding increased debt. Governments responded with support programs, including financial aid and wage subsidies. The Canadian Federation of Independent Businesses (CFIB) has provided tailored public health guidance to regional small business organizations [49]. The Canadian government is boosting investment in federal lending institutions, including the Business Development Bank of Canada and Export Development Canada, to support economic stimulus and address potential credit tightening.

Liu *et al.* [50], highlight the need for resilience, agility, and entrepreneurship in businesses during the COVID-19 crisis, focusing on its economic impact and the importance of collaboration between research, business, and government to address supply chain disruptions. Several countries, including Brazil, France, Germany, Indonesia, Italy, Mexico, Morocco, Peru, Singapore, South Korea, Turkey, and the United Kingdom, are committed to maintaining international trade and transportation links for essential goods to minimize disruptions.

The interdependence of businesses and their communities is essential, as business growth involves not only investors but also stakeholders like the community, suppliers, and employees, who often form long-term partnerships [51]. The study by [52] examines the impact of the COVID-19 pandemic on European manufacturing SMEs and suggests shifting from short-term survival measures to long-term strategies focused on innovation, internationalization, and networking for SME growth. It also emphasizes the need for policies that address inequalities among SMEs, moving beyond a one-size-fits-all approach. A comprehensive internet-based marketing strategy is crucial for businesses to meet increasing online demand, covering service quality, manufacturing, and logistics. However, the financial, technological, and human resource investments required can be challenging, especially for start-ups and small businesses. The effective use of emerging technologies is key to navigating the COVID-19 crisis. Wang *et al.* [53] explore how Chinese businesses innovate their marketing strategies in response to the pandemic, examining the types of innovations adopted, influencing factors, and the role of marketing technology in business survival and recovery. It emphasizes the importance of considering institutional and cultural contexts in future marketing innovation research.

78% of American SMEs created websites primarily to attract new customers, focusing more on local and regional market expansion than global reach [49], [54]. Key strategies for SMEs include growing their customer base and improving product and service quality and variety [49]. Digital technologies helped SMEs stay operational during COVID-19 by enabling communication and agile work [55]. However, information technology (IT) security and privacy concerns, especially in the UK and Ireland, hindered adoption. Further research is needed on SMEs' evolving work practices and privacy implications.

The study by [26] how digitalization strengthens Chinese SMEs' ability to address societal challenges, especially during COVID-19. It shows that digitalization enhances SMEs' dynamic capabilities, enabling more effective responses to public concerns [12]. Digitalization has been vital for SMEs in navigating global crises. SMEs that adopt digital technologies and business models are better prepared for public emergencies. Digitalization also supports generic crisis response strategies, improving SMEs' crisis management effectiveness. Industry-wide initiatives benefit SMEs by promoting collaboration, knowledge

sharing, and reducing hierarchical barriers. They also enable SMEs to capitalize on investments made by larger companies through network effects.

The COVID-19 pandemic highlighted the need for economic relief for micro, small, and medium-sized enterprises (MSMEs), which are especially vulnerable to its economic impacts [56]. APEC emphasizes MSME digitalization for economic recovery, promoting ICT and e-commerce through the Boracay Action Agenda to support MSME global integration [56]. The pandemic accelerated online spending, with significant increases in consumer e-commerce activity. To stay competitive, MSMEs must adapt to changing purchasing behaviors by adopting new technologies and adjusting business processes [57].

The rise in online trading during the COVID-19 pandemic in APEC economies underscores the crucial role of e-commerce in reducing the economic impact of the crisis [58]. The study by [58] examines the impact of the pandemic on German online grocery retail using Geels' multi-level perspective. It highlights a significant increase in online grocery sales but notes that the shift from traditional to online shopping was limited, as the pandemic's effects were seen as abrupt and temporary. Minimizing human-to-human transmission during the pandemic created challenges in accessing essential goods, especially groceries. E-commerce and logistics digitalization helped businesses ensure timely deliveries and reduce costs during lockdowns. However, regulatory barriers to movement and migration remained.

SMEs are increasingly involved in collaborative projects that standardize processes, enable information exchange, and promote interoperability, leading to cost reduction. These initiatives boost efficiency and productivity, enhancing overall industry competitiveness. A notable example is the Japanese fishing boat construction industry, which uses a web-based server for information sharing [59]. The study by [59] explores how Brazilian businesses in the food service, education, retail, and B2B sectors adapted to the COVID-19 pandemic, using insights from webinars. Key responses included business model adjustments, changes to supplier-tenant contracts, and efforts to maintain customer relationships. The findings emphasize the role of technology, teamwork, and resilience in overcoming challenges and preparing for future uncertainties. Additionally, the franchising model proved advantageous for adaptation, even amid the ongoing uncertainty of the pandemic's duration and impact.

The study by [60] investigates the short-term effects of COVID-19 on online food purchasing behavior in China, using an instrumental variable approach based on the distance to Wuhan. Findings reveal that higher percentages of confirmed cases increase consumers' willingness to buy food online, particularly among younger individuals, those perceiving lower online shopping risks, and urban residents. The authors call for government action to enhance online food delivery safety, protect delivery workers, support vulnerable populations, and address the digital divide by helping those with limited technological skills.

4. LIMITATIONS AND FUTURE RESEARCH

This study has two main limitations: it focused only on keywords from publications in seven major e-commerce journals from 2014 to 2024, which may limit the generalizability of the findings. Future research should include a broader range of publications. Additionally, while co-word analysis was used to examine e-commerce research, future studies could also incorporate co-author and co-citation analysis to better understand the contributions of individual researchers, journals, institutions, and countries.

5. CONCLUSION

The COVID-19 pandemic has underscored the critical role of e-commerce in business survival and has accelerated its adoption and the broader digital transformation of businesses. Governments provided swift and substantial financial aid to SMEs during the crisis, including tax deferrals, loans, grants, and wage subsidies, following a "give money now, verify later" strategy. SMEs must pursue long-term digital transformation while promoting responsible technology use and strengthening cybersecurity and privacy protections to address current and future challenges.

China's e-commerce response during the pandemic highlights the importance of advanced digital logistics and last-mile delivery for resilient supply chains. The success of e-commerce depends on private-sector innovation, supported by public policies addressing market gaps and fostering digital entrepreneurship. The pandemic has accelerated global adoption of e-commerce, emphasizing the need for government support to sustain its growth amidst ongoing challenges. To mitigate risks and ensure resilience, businesses should diversify their portfolios and supply chains. A recommended three-phase strategy involves anticipating risks, planning responses, and preparing for various scenarios. Combining traditional retail with customer-centric solutions, operational efficiency, and risk management is key to long-term success.

Governments can aid the shift to a digital economy by simplifying legal frameworks for virtual services. Providing free or subsidized access to digital services like telecommunication and e-commerce can

further support businesses and individuals in adopting digital technologies. The Italian government's initiative to create a website listing virtual resources for businesses highlights efforts to support e-commerce. Governments also play a key role in promoting e-commerce benefits, like contactless delivery, while raising awareness about online security and ensuring the authenticity of online purchases. Governments can promote cashless payment adoption by highlighting the benefits of contactless transactions and ensuring financial institutions support these methods. However, the persistence of cash-on-delivery in e-commerce underscores financial inclusion challenges, as 31% of adults globally lack bank accounts, emphasizing the need to bridge the digital divide.

This article contributes to future research by explores the evolution of e-commerce and its key role in the economies of China, the U.S., Germany, and Malaysia. It emphasizes the need for proactive government support to monitor e-commerce growth and overcome barriers, especially during the COVID-19 pandemic. The study also highlights the importance of online security and ensuring the authenticity of transactions.

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Wong Hock Tsen				✓		✓			✓		✓	✓		
Samsul Ariffin Abdul Karim						✓			✓					
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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare that are relevant to the content of this article.

DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

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